What is claimed is:

1. A control apparatus for four wheel drive vehicle having a differential limiting unit on at least either one of a front wheel side or a rear wheel side, comprising:

a turning state determining unit for determining a turning state of said vehicle;

an actual left and right wheel differential speed calculating unit for calculating an actual left and right wheel differential speed in accordance with a turning state of the vehicle;

a target differential speed setting unit for setting a left and right wheel target differential speed;

a differential limiting torque calculating unit for setting a differential limiting torque at 0 on basis of information from the differential limiting unit when an inside wheel speed falls below an outside wheel speed by a preset threshold value in a turning state and for calculating a differential limiting torque on basis of said information about the left and right wheel target differential speed and the actual left and right wheel differential speed when said inside wheel speed exceeds said outside wheel speed by a preset threshold value in said turning state; and

a front and rear wheel differential limiting torque

setting unit for setting a front and rear wheel differential limiting torque calculated in the differential limiting torque calculating unit in dependency on said differential limiting torque on basis

5   of said information.

    2. The control apparatus as set forth in Claim 1, wherein:

    0 is the threshold value used for comparing the inside

10 wheel speed with the outside wheel speed in the turning state.

    3. The control apparatus as set forth in Claim 1, wherein:

15   the actual left and right wheel differential speed calculating unit regards an actual left and right wheel differential speed as an absolute value of said left and right wheel differential speed after the differential limiting torque calculating unit calculates a

20 differential limiting torque based on said information from the differential limiting unit in dependency on the left and right wheel target differential speed and the absolute value when the turning state determining unit determines said turning state substantially as said

25 running straight condition.

4. The control apparatus as set forth in Claim 2, wherein:

the actual left and right wheel differential speed calculating unit regards an actual left and right wheel differential speed as an absolute value of said left and right wheel differential speed after the differential limiting torque calculating unit calculates a differential limiting torque based on said information from the differential limiting unit in dependency on the left and right wheel target differential speed and the absolute value when the turning state determining unit determines said turning state substantially as said running straight condition.

5. The control apparatus as set forth in claim 1, wherein:

the turning state determining unit determines said turning state from at least either one of a lateral acceleration, a yaw rate or a steering angle.

6. The control apparatus as set forth in Claim 2, wherein:

the turning state determining unit determines said turning condition from at least either one of said lateral

acceleration, said yaw rate or said steering angle.

7. The control apparatus as set forth in Claim 3, wherein:

5   the turning state determining unit determines said turning condition from at least either one of said lateral acceleration, said yaw rate or said steering angle.

8. The control apparatus as set forth in Claim 4,

10 wherein:

the turning state determining unit determines said turning condition from at least either one of said lateral acceleration, said yaw rate or said steering angle.

15   9. The control apparatus as set forth in Claim 5, wherein:

the turning state determining unit determines that the vehicle is in substantially a straight running state when a first absolute value of at least either one of

20 the lateral acceleration, the yaw rate or the steering angle is smaller than a predetermined value.

10. The control apparatus as set forth in Claim

6, wherein:

25   the turning state determining unit determines that

55

the vehicle is in substantially a straight running state when a first absolute value of at least either one of the lateral acceleration, the yaw rate or the steering angle is smaller than a predetermined value.

5

11.   The control apparatus as set forth in Claim 7, wherein:

the turning state determining unit determines that

10   the vehicle is in substantially a straight running state when a first absolute value of at least either one of the lateral acceleration, the yaw rate or the steering angle is smaller than a predetermined value.

15   12.   The control apparatus as set forth in Claim 8, wherein:

the turning state determining unit determines that the vehicle is in substantially a straight running state when a first absolute value of at least either one of

20   the lateral acceleration, the yaw rate or the steering angle is smaller than a predetermined value.

13.   A control method for four wheel drive vehicle having a differential limiting unit on at least either

25   one of a front wheel side or a rear wheel side, comprising

steps of:

determining the turning state of said vehicle;

calculating an actual left and right wheel differential speed in accordance with a turning state of the vehicle;

setting a left and right wheel target differential speed;

setting a differential limiting torque at 0 on basis of information from the differential limiting unit, when an inside wheel speed falls below an outside wheel speed by a preset threshold value in a turning state;

calculating a differential limiting torque on basis of said information about the left and right wheel target differential speed and the actual left and right wheel differential speed, when said inside wheel speed exceeds said outside wheel speed by a preset threshold value in said turning state; and

setting a front and rear wheel differential limiting torque calculated at the previous step in dependency on said differential limiting torque on basis of said information.

14. The control method as set forth in Claim 13, wherein:

0 is the threshold value used for comparing the

inside wheel speed with the outside wheel speed in the turning state.

15. The control method as set forth in Claim 13, wherein:

the actual left and right wheel differential speed calculating step regards an actual left and right wheel differential speed as an absolute value of said left and right wheel differential speed after the differential limiting torque calculating step calculates a differential limiting torque based on said information from the differential limiting unit in dependency on the left and right wheel target differential speed and the absolute value when the turning state is determined said turning state substantially as a running straight condition.

16. The control method as set forth in Claim 14, wherein:

the actual left and right wheel differential speed calculating step regards an actual left and right wheel differential speed as an absolute value of said left and right wheel differential speed after the differential limiting torque calculating step calculates a differential limiting torque based on said information

from the differential limiting unit in dependency on the left and right wheel target differential speed and the absolute value when the turning state is determined said turning state substantially as a running straight

5   condition.

      17.   The control method as set forth in Claim 13, wherein:

      the turning state is determined said turning state

10   from at least either one of a lateral acceleration, a yaw rate or a steering angle.

      18.   The control method as set forth in Claim 14, wherein :

15   the turning state is determined said turning state from at least either one of a lateral acceleration, a yaw rate or a steering angle.

      19.   The control method as set forth in Claim 15,

20   wherein :

      the turning state is determined said turning state from at least either one of a lateral acceleration, a yaw rate or a steering angle.

25   20.   The control method as set forth in Claim 16,

wherein :

the turning state is determined said turning state from at least either one of a lateral acceleration, a yaw rate or a steering angle.

5

21. The control method as set forth in Claim 17, wherein:

the turning state is determined that the vehicle is in substantially a straight running state when a first

10 absolute value of at least one of the lateral acceleration, the yaw rate or the steering angle is smaller than a predetermined value.

22. The control method as set forth in Claim 18,

15 wherein:

the turning state is determined that the vehicle is in substantially a straight running state when a first absolute value of at least one of the lateral acceleration, the yaw rate or the steering angle is smaller than a

20 predetermined value.

23. The control method as set forth in Claim 19, wherein:

the turning state is determined that the vehicle

25 is in substantially a straight running state when a first

absolute value of at least one of the lateral acceleration, the yaw rate or the steering angle is smaller than a predetermined value.

5   24.   The control method as set forth in Claim 20, wherein:

the turning state is determined that the vehicle is in substantially a straight running state when a first absolute value of at least one of the lateral acceleration,

10   the yaw rate or the steering angle is smaller than a predetermined value.